MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

EEL4116 – POWER STATIONS

(LE)

30 MAY 2017
9:00 AM – 11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question Paper consists of 5 pages including the cover page with 5 Questions only.

2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the Answer Booklet provided.

Question 1 [20 marks]

a) A medium voltage industrial consumer has the following data for its monthly electricity bill:

Total electricity consumption in kWh	– 183, 672 units
The reactive power consumption in kVArh	– 244, 896 units
The monthly load factor	– 71%
Electricity usage	– 10 pm to 8 am every day

The tariff rate (Tariff E2 – TNB) is shown in Table Q1(a).

Table Q1(a)

(a) Tariff E2 (Medium Voltage Peak/ Off Peak Industrial Tariff)	Unit	Rates
For each kilowatt of maximum demand per month	RM/kW	29.30
For all kWh during peak hour	Sen/kWh	28.1
For all kWh during off peak hour	Sen/kWh	17.3
The minimum monthly charge is RM600.00		
(b) Power Factor Penalty Rate		
Below 0.85 and up to 0.75 lagging	1.5% of the bill for that month for each one-hundredth (0.01).	
Below 0.75 lagging, in addition to the charge payable under sub-paragraph (a) above,	A supplementary charge of 3% of the bill for that month for each one-hundredth (0.01).	

Analyse the following by considering 30 days per month and 4 weeks per month.

(i) The monthly maximum demand for this consumer (assuming 30 days/month).

[6 marks]

(ii) The average power factor for this consumer and calculate the total penalty charge due to the poor power factor, if any.

[8 marks]

(iii) The total monthly bill charge for this consumer.

[2 marks]

Continued...

b) At the end of a power distribution system, a certain feeder supplies three distribution transformers as shown in Table Q1(b), each one supplying a group of customers with connected loads. If the diversity factor among the transformers is 1.3, analyse the maximum load on the feeder.

[4 marks]

Table Q1(b)

Transformer	Load	Demand Factor	Diversity of groups
Transformer No.1	10kW	0.65	1.5
Transformer No.2	12kW	0.60	3.5
Transformer No.3	15kW	0.70	1.5

Question 2 [20 marks]

a) Define the TWO (2) essential criteria to select a site for thermal power plant.

[6 marks]

b) Explain the working principles of a combined cycle power plant with a simple sketch.

[14 marks]

Question 3 [20 marks]

a) List the main parts of a nuclear reactor.

[7 marks]

b) Define co-generation power plant and explain TWO (2) of its advantages.

[8 marks]

c) Briefly explain the working principle of Back-pressure turbine and Pass-out turbine which are normally used in co-generation.

[5 marks]

Continued...

Question 4 [20 marks]

a) For a substation,

(i) Draw a double bus double breaker scheme of a substation.

[4 marks]

(ii) Explain the THREE (3) advantages and THREE (3) disadvantages in the above substation.

[6 marks]

b) Explain the operation of the following protective devices,

(i) Current limiting fuses.

[5 marks]

(ii) Disconnect switches

[5 marks]

Question 5 [20 marks]

a) What are the general guidelines, for which the electricity tariff system has evolved from?

[5 marks]

b) A power supply has the loads shown in Table Q5(b),

Table Q5(b)

Type of load	Max. demand (kW)	Diversity of group	Demand factor
Domestic	1500	1.2	0.8
Commercial	2000	1.1	0.9
Industrial	10000	1.25	1

If the overall system diversity factor is 1.35, determine the following:

(i) Maximum demand

[4 marks]

(ii) Connected load of each type

[4 marks]

Continued...

c) A diesel power station will be installed to supply power to a suburban area having the following particulars:

- 1000 houses with average connected load of 1.5 kW in each house. The demand factor and diversity factor being 0.4 and 2.5, respectively.
- 10 factories having overall maximum demand of 90 kW.
- 7 tubewells of 7 kW each and operating together in the morning.

The diversity factor among the above three types of consumers is 1.2. Determine the minimum capacity of the power station.

[7 marks]

End of Paper.